

# MATERIAL SAFETY DATA SHEET

SRM Supplier: National Institute of Standards and Technology  
Standard Reference Materials Program  
Bldg. 202 Rm. 211  
Gaithersburg, Maryland 20899

SRM Number: 3112a  
MSDS Number: 3112a  
SRM Name: Chromium Standard Solution  
Date of Issue: January 1993  
Date of Revision: 31 August 1999

MSDS Coordinator: Joylene W.L. Thomas  
Phone: (301) 975-6776  
ChemTrec: 1-800-424-9300

FAX: (301) 926-4751  
e-mail: SRMMSDS@nist.gov

## SECTION I. MATERIAL IDENTIFICATION

**Material Name:** Chromium Standard Solution

**Description:** SRM 3112a is a single element solution prepared gravimetrically to contain a nominal 10 mg/g of chromium with a nitric acid volume fraction of 10 %.

**Other Designations:** **Chromium in Nitric Acid** (aqua fortis; hydrogen nitrate; azotic acid; engraver's acid); **\*Chromium Nitrate** (chromic nitrate; chromium salt; chromium (III) nitrate; chromium trinitrate) in **Spectrometric Solution**

Name	Chemical Formulas	CAS Registration Numbers
Nitric Acid	HNO <sub>3</sub>	7697-37-2
Chromium Nitrate	Cr(NO <sub>3</sub> ) <sub>3</sub>	13548-38-4
Chromium	Cr	7440-47-3

**DOT Classification:** Nitric Acid, Solution, UN2031

**Manufacturer/Supplier:** Available from a number of suppliers

\* The addition of chromium to nitric acid, along with other intermediate chemical reactions, forms chromium nitrate which will precipitate upon evaporation or drying of the solution.

## SECTION II. HAZARDOUS INGREDIENTS

Hazardous Components	Nominal Concentration (%)	Exposure Limits and Toxicity Data
Nitric Acid	10	ACGIH TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 2 mg/kg or 5 mg/m <sup>3</sup>
		Human, Oral: LD <sub>50</sub> : 430 mg/kg
Chromium Nitrate	4.58	ACGIH TLV-TWA: 0.5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 0.5 mg/m <sup>3</sup> (soluble salts)
		Rat, Oral: LD <sub>50</sub> : 3250 mg/kg
		Mouse, Oral: LD <sub>50</sub> : 2976 mg/kg
Chromium	1	ACGIH TLV-TWA: 0.5 mg/m <sup>3</sup>
		OSHA TLV-TWA: 1 mg/m <sup>3</sup>
		Rat, Unreported Route: LD <sub>50</sub> : 27 500 µg/kg

### SECTION III. PHYSICAL/CHEMICAL CHARACTERISTICS

Nitric Acid	Chromium Nitrate	Chromium
<b>Appearance and Odor:</b> A white to slightly yellow liquid that darkens to a brownish color upon aging and exposure to light	<b>Appearance and Odor:</b> A pale green, extremely deliquescent powder	<b>Appearance and Odor:</b> An odorless, steel-gray, lustrous metal or powder
<b>Relative Molecular Mass:</b> 63.02	<b>Relative Molecular Mass:</b> 238.03	<b>Relative Atomic Mass:</b> 51.996
<b>Density:</b> 1.054 (10 % nitric acid)	<b>Density:</b> Not available	<b>Density:</b> 7.20
<b>Solubility in Water:</b> Soluble	<b>Solubility in Water:</b> Soluble	<b>Solubility in Water:</b> Insoluble
<b>Solvent Solubility:</b> Decomposes in alcohol	<b>Solvent Solubility:</b> Soluble in alcohol, ethyl acetate, and dimethyl sulfoxide	<b>Solvent Solubility:</b> Soluble in sulfuric acid and hydrochloric acid

**NOTE:** The physical and chemical data provided are for the pure components. Physical and chemical data for this chromium/nitric acid solution do not exist. The actual behavior of the solution may differ from the individual components.

## SECTION IV. FIRE AND EXPLOSION HAZARD DATA

**Flash Point:** N/A

**Method Used:** N/A

**Autoignition Temperature:** N/A

<b>Flammability Limits in Air (Volume %):</b>	<b>UPPER:</b>	N/A
	<b>LOWER:</b>	N/A

**Unusual Fire and Explosion Hazards:** Although nitric acid does not burn, it is a powerful oxidizing agent that can react with combustible materials to cause fires. Chromium and chromium nitrate are negligible fire hazards when exposed to heat or flames.

**Extinguishing Media:** Use extinguishing media that is appropriate to the surrounding fire. Use a water spray to dilute nitric acid and to absorb liberated oxides of nitrogen.

**Special Fire Procedures:** Fire fighters should wear a self-contained breathing apparatus (SCBA) with a full face piece in the pressure demand or positive mode and other protective clothing.

## SECTION V. REACTIVITY DATA

**Stability:**            **X**   **Stable**                       **Unstable**

**Conditions to Avoid:** Avoid contact with incompatible materials.

**Incompatibility (Materials to Avoid):** Keep nitric acid away from organic materials, plastics, rubber, and some forms of coatings. Nitric acid is incompatible with chlorine and metal ferrocyanide. Chromium is incompatible with combustible materials, bases, oxidizing materials, halogens, peroxides, and metals.

See Section IV: *Unusual Fire and Explosion Hazards*

**Hazardous Decomposition or Byproducts:** Hazardous decomposition of nitric acid can produce various nitrogen oxides, including nitric oxide (NO), nitrogen dioxide (NO<sub>2</sub>), nitrous oxide (N<sub>2</sub>O), as well as nitric acid mist or vapor. Thermal oxidation of chromium and chromium nitrate may release toxic and/or hazardous gases.

**Hazardous Polymerization:**               Will Occur                                  X   Will Not Occur

---

**SECTION VI. HEALTH HAZARD DATA**

---

**Route of Entry:**          X   **Inhalation**                      X   **Skin**                      X   **Ingestion**

**Health Hazards (Acute and Chronic): Nitric Acid:** Nitric acid may be fatal if inhaled, swallowed, or absorbed through skin. This material causes burns and is extremely destructive to tissue of the mucous membranes and upper respiratory tract (URT), eyes, and skin. Inhalation may be fatal as a result of spasm, inflammation, and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

**Chromium and Chromium Nitrate:** Chromium and chromium nitrate may be harmful by inhalation, ingestion, or skin absorption. Exposure may cause irritation of the skin, eyes, mucous membranes, and URT. Prolonged exposure can cause kidney damage, liver damage, stomach pains, vomiting, or diarrhea. Chromium nitrate may cause allergic skin reactions, tearing of the eyes, and burns. Solutions of chromium nitrate may be corrosive to the skin and eyes.

Animals exposed to chromium in the trivalent state for four months developed chronic irritation of the bronchus and lung parenchyma and dystrophic changes in the liver and kidneys. There is sufficient evidence of respiratory carcinogenicity in men occupationally exposed during chromate production. However, hexavalent chromium is more likely than trivalent chromium to be the etiologic agent in chromium induced cancer.

**Medical Conditions Generally Aggravated by Exposure:** Eye disorders, respiratory disorders, skin disorders, and allergies.

**Listed as a Carcinogen/Potential Carcinogen:**

	<b>Yes</b>	<b>No</b>
In the National Toxicology Program (NTP) Report on Carcinogens	<u>          </u>	<u>  X  </u>
In the International Agency for Research on Cancer (IARC) Monographs	<u>          </u>	<u>  X  </u>
By the Occupational Safety and Health Administration (OSHA)	<u>          </u>	<u>  X  </u>

**EMERGENCY AND FIRST AID PROCEDURES :**

**Skin Contact:** Remove contaminated shoes and clothing. Rinse affected area with large amounts of water followed by washing the area with soap and water. Watch for chemical irritations and treat them accordingly. Obtain medical assistance if necessary.

**Eye Contact:** Immediately flush eyes, including under the eyelids, with copious amounts of water for at least 15 min. Obtain medical assistance if necessary.

**Inhalation:** If inhaled, move the victim to fresh air. If breathing is difficult, give oxygen; if the victim is not breathing, give artificial respiration. Obtain medical assistance if necessary.

**Ingestion:** If ingestion occurs, wash out mouth with water. **DO NOT** induce vomiting. Contact medical assistance if necessary.

**NOTE (Nitric Acid):** Wash affected skin areas with 5 % solution of sodium bicarbonate (NaHCO<sub>3</sub>). If ingested, the risk versus the benefit of the passage of a naso-gastric tube is debatable. Activated charcoal is of no value. **DO NOT** give the exposed person bicarbonate to neutralize the material.

**TARGET ORGAN(S) OF ATTACK:**        **Nitric Acid:** Skin, teeth, eyes, and URT  
   **Chromium and Chromium Nitrate:** Respiratory system, liver and kidneys

---

## SECTION VII. PRECAUTIONS FOR SAFE HANDLING AND USE

---

**Steps to be Taken in Case Material Is Released or Spilled:** Notify safety personnel of spills. Surfaces contaminated with spills should be covered with soda ash or sodium bicarbonate to neutralize the acid. Place the neutralized material into containers suitable for eventual disposal, reclamation, or destruction.

**Waste Disposal:** Follow all federal, state, and local laws governing disposal.

**Handling and Storage:** Provide general and local explosion proof ventilation systems to maintain airborne concentrations below the TLV. Provide approved respiratory apparatus for nonroutine or emergency use. Use an approved filter and vapor respirator when the vapor or mist concentrations are high. Wear gloves and chemical safety glasses where contact with the liquid or high vapor concentrations may occur. An eye wash station and washing facilities should be readily available near handling and use areas. Wash exposed skin areas several times a day with soap and warm water.

**NOTE:** Contact lenses pose a special problem; soft lenses may absorb irritants and all lenses concentrate them.  
**DO NOT** wear contact lenses in the laboratory.

---

## SECTION VIII. SOURCE DATA/OTHER COMMENTS

---

**Sources:** MDL Information Systems, Inc., MSDS *Chromium*, June 2, 1999.  
MDL Information Systems, Inc., MSDS *Chromic Nitrate*, September 10, 1998.  
MDL Information Systems, Inc., MSDS *Nitric Acid*, June 2, 1999.  
The Merck Index, 11th Ed., 1989.  
The Sigma-Aldrich Library of Chemical Safety Data, Ed. II, 1988.

**Disclaimer:** Physical and chemical data contained in this MSDS are provided only for use in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data on the MSDS. The certified values for this material are given on the NIST Certificate of Analysis.